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VOL. 1. NO. 1.

FOSSIL SHELLS
OF
THE TERTIARY FORMATIONS
OF
NORTH AMERICA,

ILLUSTRATED BY FIGURES DRAWN ON STONE,
FROM NATURE.

BY T. A. CONRAD,
Member of the Acad. Nat. Sc. of Philada.

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PHILADELPHIA:
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October 1, 1832.

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VOL. I.

PHILADELPHIA:
1832.

BRITISH MUSEUM NATURAL HISTORY

TO

SAMUEL GEORGE MORTON, M. D.

MEMBER OF THE AMERICAN PHILOSOPHICAL SOCIETY,
CORRESPONDING SECRETARY OF THE ACADEMY OF NATURAL SCIENCES, OF
PHILADELPHIA, &C.

In publishing the fossil shells of our Tertiary formations, it is a pleasure as well as a duty to inscribe to you a work, which, whatever its merits, would not have appeared without your encouragement and assistance. Your zeal for establishing the Geology of our country on its only permanent basis, organic remains, has added a valuable series of American fossils to the splendid collections of the Academy of Natural Sciences, to which I owe the opportunity to figure and describe nearly all the species illustrated in the following pages; but I sincerely regret that your professional duties are too arduous to permit you to undertake a work for which you are so much better qualified than myself; for, with such ample materials, you could not have failed to render it acceptable both to the Geologist and the student in Conchology.

T. A. CONRAD.

PREFACE.

The vast abundance of fossil shells which characterize the Tertiary formations throughout the world, render it necessary to devote particular works to their elucidation, in which accurate figures may enable us to study and compare them under every variety of geographical distribution.

In Europe, they have received that attention they so eminently deserve in a Geological point of view, and particularly those of the environs of Paris have been accurately figured and described by M. Deshayes, and Sowerby's work on the British fossil Testacea has proved an invaluable assistant to inquirers into the history of European formations. Various memoirs on subjects connected with Geology constantly appear in the journals of the day in Europe, replete with interesting details, and illustrated by excellent figures of organic remains, serving to shew and to excite still more the eager curiosity which daily adds new votaries to this fascinating science. To endeavour to awaken in this country the same laudable zeal for extending the boundaries of scientific enquiry, I have undertaken to condense within narrow limits, the history of our numerous species of Tertiary fossils, not doubting that sufficient encouragement will be extended to a publication like the present, as works of reference are absolutely necessary, and certainly the details are more valuable in this condensed form, than when scattered through one, or as generally happens, various miscellaneous and voluminous journals.

The fossil shells of the older Secondary rocks are numerous and very important, and it is my intention to publish them on the conclusion of the present work, if I be not happily anticipated by some abler naturalist. The organic remains of the Ferruginous Sand formation have already been illustrated by Dr. Morton, who is about to re-publish his essays, with much additional information and with splendid lithographic figures of shells and zoophytes.

The beauty, variety, and peculiar character of our Tertiary fossils, are such as to recommend them to the notice of the mere Conchologist; but when viewed in connexion with Geological phenomena, they will prove, in consequence of their vast extent and continuous beds, even more important than the most celebrated contemporaneous deposits in Europe. This region has scarcely as yet met the eye of a practical Geologist, since the importance of extraneous fossils has been duly appreciated, or surely we should have had a valuable detailed account of the scientific treasures which extend almost without interruption from New Jersey, inclusive, to the Gulf of Mexico.

Three different classes of organic remains will be remarked by every observer of the formations in question; and examples of each are included in the western peninsula of Maryland. The first consists chiefly of extinct species; the second is a mixture of extinct species with others still inhabiting the coast of the United States, and the third embraces existing species alone. It is but lately that deposits similar to the latter have attracted the attention they merit, and they seem to prove that the Tertiary formations pass insensibly into each other, and that a new creation of marine shells had gradually taken the place of the old. It is certain that the lower, or oldest of these strata, always form the western boundary of the newer beds, and the most recent strata rest only on the eastern limits of this middle class of depositions. In those localities where recent and extinct species are indiscriminately mingled, a few shells occur, which although they cannot be satisfactorily referred to existing species, resemble them in such a manner as to excite a suspicion that they may be varieties occasioned by a difference of temperature, &c. between the ancient ocean and the present.

The banks of the larger rivers of the Tertiary region contain incredible numbers of shells, which are profusely scattered on the sands beneath. These banks are often high and perpendicular, composed of sand and clay, so very friable, that immense masses, loosened by the frost, frequently fall, strewing the margins of these rivers with the Pines which skirt their elevated bluffs: thus at a place called the Rocks, on James River, a few miles from the village of Smithfield, it is difficult to walk along the shore, when the tide is in, in consequence of fallen trees, and masses of clay filled with innumerable shells. This place takes it name from enormous indurated masses evidently broken off from the upper portion of the bank: these are composed of sand charged with shells, casts, and abundance of a small species of *Echinus*, rarely occurring in the inferior strata.

The Upper Marine formation is distinguished by a multiplicity of species, chiefly of bivalve shells, for the univalves are comparatively rare and particular species occur very abundantly in certain localities, which are rare or wanting in others but a few miles distant. The same circumstance is observable in the habits of recent species. M. Marcel De Serres, in his work on the Geology of the South of France, gives an interesting view of facts connected with this subject, and shews that even difference of seasons may have influenced local depositions.

It has been remarked that organic remains found in cold or temperate climates are analogous to, or identical with those of the tropics, or at least of a less degree of latitude than the fossil localities; but in Virginia and North Carolina, some species are found, in no respect differing from shells living on the coasts of Rhode Island and Massachussetts. These are associated with extinct species, and embrace *Mactra tellinoides*, *M. lateralis*, *Nucula limatula*, *N. proxima*, *Lucina contracta*, *L. divaricata*, and several others.

The recent shells have been sought with avidity on the shores of every sea, to adorn the cabinets of the curious with the symmetry and beauty of their forms, or the brilliancy of their colours ; but the science of Geology has given to the more homely fossils, a charm which amply compensates for the loss of a portion of exterior ornament, inasmuch as they are mute interpreters of those strange revolutions, of which the memory of man has preserved not a solitary trace. They chronicle the various eras of an unknown world, where one ocean has retired to give place to another with its peculiar tribes of animated beings, whose silent eloquence reveals the mysterious operations of Nature, when the sudden elevation of mountains, irruption of seas, and destruction of various races of animals and plants, were forming in the crust of our globe those numerous strata, the study of which must ever be an inexhaustible source of pleasure and instruction. Thus have long periods of violence and revolution been necessary to create the beautiful variety of the present surface of the earth, and perhaps to prepare it for the support of man, as all these changes appear to have been effected anterior to the existence of the human race.

In the more ancient oceans existed animals of gigantic size, no living analogies of which are known, while about three hundred species of *Ammonites* floated upon the surface, or lived in vast colonies in the depth of the sea; and yet not a solitary species has been spared by those revolutions of a "past eternity" which now offer to our minds the fascinating study of relics, abstracting us from the present and leading to the contemplation of a former world. But in proportion as we advance in the ascending series of stratification, we find the organic remains approaching more and more to the existing order of nature, until at last we arrive at those not to be distinguished from the present inhabitants of the sea. "Life therefore" observes Cuvier, "has been often disturbed on this earth by terrible events—calamities which, at their commencement, have perhaps moved and overturned to a great depth the entire outer crust of the globe, but which, since these first commotions, tions, have uniformly acted at a less depth and less generally. Numberless living beings have been the victims of these catastrophies; some have been destroyed by sudden inundations, others have been laid dry in consequence of the bottom of the seas being instantaneously elevated. Their races even have become extinct, and have left no memorials of them except some small fragment which the naturalist can scarcely recognize.

"Such are the conclusions which necessarily result from the objects that we meet with at every step of our enquiry, and which we can always verify by examples drawn from almost every country. Every part of the globe bears the impress of these great and terrible events so distinctly, that they must be visible to all who are qualified to read their history in the remains which they have left behind.

"But what is still more astonishing and not less certain, there have not been always living creatures on the earth, and it is easy for the observer to discover the period at which animal productions began to be deposited.

Philadelphia, October 1*st*, 1832.

INTRODUCTION.

BRIEF VIEW OF THE TERTIARY FORMATIONS OF THE UNITED STATES.

Syn. Supercretaceous group, *De la Beche.* Superior order, *Conybeare and Phillips.* Terrains izemiens thalasiques, *Al. Brongniart.*

Each of the great classes is again divided into a number of subordinate deposits, denominated *formations*, of which the Tertiary appears to possess three, called, in Europe, the *Upper Marine*, *London Clay* and *Plastic Clay* formations. The last two of these names are very exceptionable, the one being local and the other far from descriptive. It is therefore proposed in the following work to speak of the three formations according to the order of their succession, and, at the suggestion of a friend, to call them the Upper Tertiary or Upper Marine, the Middle Tertiary and the Lower Tertiary. The relative position of these different formations will be best conveyed by the the following diagram; merely premising that we are fully aware of the objections which have been urged against these divisions, and that we adopt them in the absence of a better nomenclature, as possessing a very convenient, and, we believe, a natural adaptation to the strata.

	Characteristic fossils.	*Localities.*
Alluvium		
Diluvium	Bones of terrestrial animals.	
Gravier coquillier, of *Brong*. Crag.	Shells, all of existing species.	Mouth of the Potomac.
. . . .		
Upper Marine, or Upper Tertiary	Shells, chiefly bivalve, all the genera and many of the species existing.	Peninsula of Maryland, and eastern parts of Virginia, N. and S. Carolina, Georg.
Middle Tertiary or London Clay, & Calcaire grossier	Shells, nearly all living genera, but generally extinct species. Large proportion of univalv.	Fort Washington, Md., Virginia? Vance's Ferry, S. C. Claiborne, Alabama.
Lower Tertiary, or Plastic Clay.	Beds of lignite and a few marine shells.	Bordentown, N. J., Martha's Vineyard, &c.

The preceding diagram represents the series so far as it has been developed in this country. In Europe, the Upper Tertiary is not unfrequently alternated with beds of fresh water shells, mostly attributable to a lacustrine origin No such examples have yet been noticed on this side the Atlantic. Again, the European Tertiary is based upon the Chalk formation; but although in the United States, no Chalk, mineralogically speaking, has been observed, Dr. Morton has shewn, in the most satisfactory manner, that we possess its Geological equivalent in the marl of New Jersey, Delaware, &c. which is in fact contemporaneous with the Lower Chalk or Ferruginous Sand formation of Europe; the upper mass, or Chalk of commerce, being wanting.

These formations, collectively, form the Atlantic margin of the United States, from Sandy Hook, in New Jersey, to the peninsula of Florida, from whence they skirt the Gulf of Mexico to the waters of the Mississippi. Of the Geology of the region west of this, very little is known; but on Red River, shells of the Ferruginous Sand formation were discovered by Mr. Nuttal during his hazardous journey through the inhospitable wilds of the Arkansas territory, led solely by the love of Science, to which he had nearly fallen a martyr.

This southern portion appears to occupy a much broader space than is observable in the northern sections, but the order of position is of course the same in all. The same formations appear to have an insulated existence in Martha's Vineyard, the Elizabeth Island, Long Island, &c. on the coasts of the the Eastern States. The tract to which we allude is called Alluvial on Mr. Maclure's geological map of the United States; and although the name is incorrect, the geographical boundaries there given are sufficiently accurate for general purposes.

Let us now take a glance at the several subdivisions of the Tertiary class, together with the Alluvial and Diluvial deposits which are frequently found overlying them.

Alluvium. This name is applied to all deposits derived from causes now in operation. Such are the accumulations of mud and other debris at the mouths and along the courses of rivers; the drifting sands of the sea coast; peat bogs, &c. &c. Of all these circumstances we see numerous examples throughout the Atlantic margin of the United States, and especially in

New Jersey. "These operations," observes Mr. Mantell, "even if carried on upon an extended scale, are manifestly unimportant as agents in any of those grand revolutions which constitute the principal objects of Geological enquiry."

Diluvium. On the greater part of the earth's surface are observed beds of sand and clay, with rolled pebbles of various sizes, all bearing marks of the action of a violent current, which has first comminuted and rounded the fragments of rocks, and then strewed them promiscuously on all the other formations. Thus we find the Diluvial beds lying directly on the Primitive, Secondary, and Tertiary rocks; forming what has been termed the mantle of the earth's crust. The Diluvium frequently encloses the remains of large quadripeds, which appear to have perished in the catastrophe to which these deposits owe their origin. In the great Atlantic tract, now under consideration, the Diluvium is well characterized and in many places very extensive. To it are referred the bones and teeth of the *Mastodon*, found at Pemberton, N. J., and in other places farther south: also the bones of the elephant exhumed in New Jersey, North Carolina, &c., and those of the *Megatherium*, in Georgia. By some Geologists, these remains are considered to be embraced in the Alluvial and not in the Diluvial deposits, and Mr. Featherstonhaugh shews that, in reference to this country at least, the facts are in favour of the former of these opinions.

In the deposits above described, but little order or regularity is perceptible; their various contents are, for the most part, indiscriminately mingled; but those which form the subject of the following remarks, will be found to present a certain and constant order of superposition; particular species will be seen to occur in some of the strata, and to be wanting in others; and, by comparing these remains, we are able to identify a formation, wherever it occurs, and to refer it to its proper place in the Geological scale.

UPPER MARINE FORMATION.

We adopt this formation as defined in the admirable work of Conybeare and Phillips. Its existence in this country was first suggested by Dr. Van Rensellaer, and it was afterwards more specifically examined and illustrated by Dr. Morton, in the Journal of the Academy of Natural Sciences.

Mineralogical characters. These beds are often a slightly argillaceous yellowish sand, in which the fossils are imbedded without cohesion. In other instances the matrix is hard and siliceous, obviously composed of fine sand. In others, again, a yellowish or gray clay forms the strata, and sometimes all these substances are variously mixed, but the lower stratum is invariably a lead coloured clay or argillaceous marl. There is mostly some intermixture of comminuted shells, but that the fossils of these beds have been deposited in a tranquil sea, is obvious from the extreme perfection of the shells, and the constant occurrence of the most delicate bivalves, with both valves in their natural connexion.

Organic characters. Speaking of this formation, in Europe, Conybeare and Phillips remark, that "the shells are found in an excellent state of preservation, and though generally in a confused mixture, are sometimes so disposed, that patches of particular genera and species appear."

"Like fossils of most other strata, this assemblage of shells manifests a peculiar distinctive character. A few shells only, which may be placed among those which are supposed to be lost, or among those which are the inhabitants of the distant seas, are here discoverable, the greater part not appearing to differ specifically, as far as their altered state will allow of determining, from the recent shells of neighbouring seas."

The above description is strikingly applicable to the American Upper Marine beds, in certain districts, but in others a large proportion of extinct species, and such as inhabit distant seas, are of common occurance, and manifest a difference in the relative ages of the deposits, yet none of those which I am now considering exhibit any of the characters peculiar to the *London clay* and *Calcaire grossier.* For the present, it may suffice to remark, that of all the species which these strata have hitherto afforded, about forty are specifically identical with the living Testacea now inhabiting the coasts of the United States and the islands of the West Indies. A considerable number of species are common to the strata of Europe and America; while some of these very shells are also found recent on both sides of the Atlantic, shewing how extensive may be the distribution, and how long the duration of a single species.

Geographical distribution. This formation first appears in

New Jersey, south-east of Salem, and continues through all the States south of this, forming their Atlantic margins, and extending from one hundred to one hundred and fifty miles west from the sea.

MIDDLE TERTIARY FORMATION.

Syn. London Clay *of English authors;* Calcaire grossier *of the French.*

Mineralogical characters. This formation, like most others, presents itself under various Mineralogical appearances; it often exhibits beds of silicious sand, of a brownish colour, and in this the fossils are in the finest preservation. Another variety is a friable granular limestone, containing comminuted fragments of shells, and indeed is sometimes almost wholly composed of them. It is of a light ferruginous colour, and strongly resembles certain varieties of the *Calcaire grossier* of France.

Again, this formation presents a compact tenacious limestone, with a dull granular fracture, and replete with minute green grains. It contains a large proportion of clay, and though abounding in fossils, these are mostly mere casts.

Organic characters. "The testaceous mollusca are very numerous and beautifully preserved, often retaining nearly the appearance of recent shells. There are very few *genera* of recent shells which have not some representation imbedded in this formation, but the specific character is usually different, that difference being often, however, so minute as to escape an unpractised eye: on the other hand, but few of the *extinct* genera, so common in the older formations, occur in this; so that it seems to hold a middle character in this respect between the earlier and more recent beds."

Here again, the analogy which exists in the organic characters of this formation, on both sides of the Atlantic, is not less marked than in the Upper Marine strata.

The *Calcaire grossier*, of the French, is a coarse limestone, more or less hard; some of its beds are sandy and contain green grains of silicate of iron. This division of the *London Clay* is amazingly productive of organic remains; and it will be hereafter shewn that some of its fossils are specifically the same with those of the contemporaneous deposits of this country.

Geographical distribution. In the vicinity of Fort Washington, on the Potomac river, Maryland, this formation first appears to the north. We have seen fossils peculiar to it, said to be from Virginia, but the exact locality is unknown. It occurs again at Vance's Ferry, South Carolina, and at Claiborne, Alabama, where its fossils are in the greatest abundance and best state of preservation. It is also very interesting in this locality, from the circumstance of its resting on very white friable Secondary limestone, full of *Nummulites*, and containing *Gryphæa*, &c. which again reposes on the *Green Sand.*

LOWER TERTIARY FORMATION.

Plastic Clay, *of English authors;* Argile plastique, *Brong.*

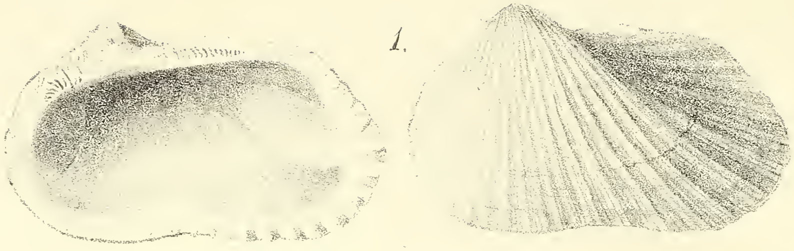
Mineralogical characters. These consist in alternating stratified beds of sand and gravel, of various colours; in these beds, and especially in the clay, *Lignite* is an abundant and characteristic substance. Iron pyrites and *Succinite,* Brong., also occur; the former in great abundance. Professor Hitchcock has lately discovered a silicious breccia in the Plastic clay at Gayhead, Martha's Vineyard.

In France, the black clay and Lignites form a superstratum of this formation; the true Plastic clay deposit being absolutely composed of various coloured and seemingly pure clays, used in the potteries, and containing fresh water and marine shells.

Organic characters. Besides the *Lignite*, a few casts of marine shells occur in our Lower Tertiary, apparently referrible to the genera *Venus*, *Tellina*, &c. Professor Hitchcock has also discovered in the quartzose breccia mentioned above, bones and teeth of the shark, crocodile, &c.

Geographical distribution. We are indebted to Mr. John Finch for the first detailed account of this formation, in America, which appears to extend, in patches, from the islands of New England to the States bordering the Gulf of Mexico. Its most obvious localities are, Martha's Vineyard; Sand's Point, on Long Island; Bordentown, Whitehill, &c. in New Jersey; Telegraph Hill, near Baltimore; Cape Sable, in Maryland, and many other places farther south.

All the preceding formations are based on the *Ferruginous Sand series*, and Dr. Morton has shewn, that so far as his investigations have extended, no species of fossil shell of the latter ormation has been detected in the superimposed strata.



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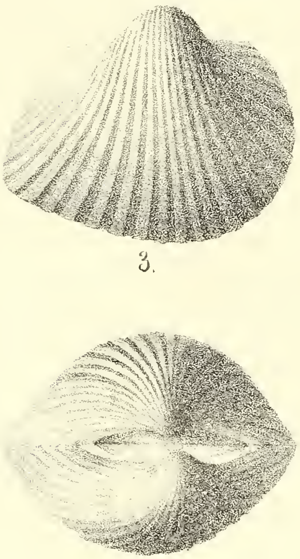

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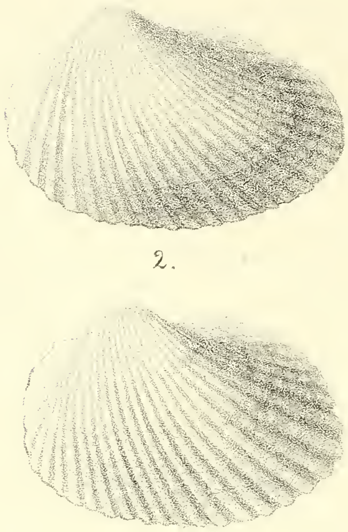

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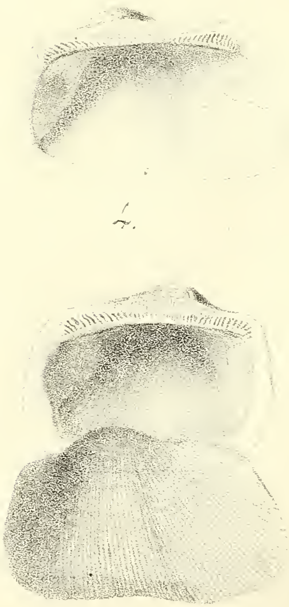

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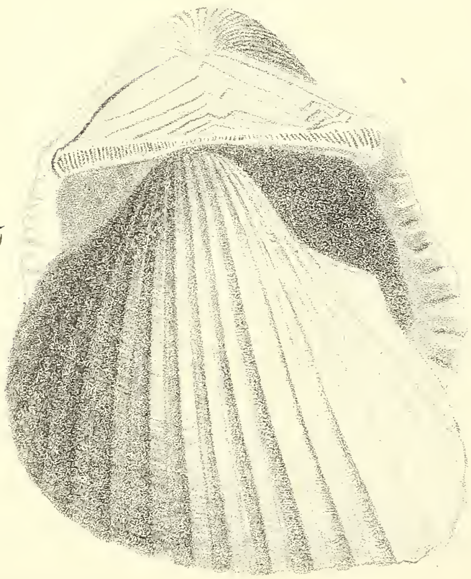

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M E D BROWN del: his Lith. N° 5 Library St P

FOSSIL SHELLS, &c.

ARCA LIMULA. *Tab.* 1, *fig* 1.

Oblong, sinuous, rather thin; ribs numerous, crossed by striæ, which are equally distinct in the interstices; ribs double on the posterior side where they alternate with fine lines; umbo angulated behind; hinge area narrow, oblique, and transversely striated; basal margin contracted near the middle; inner margin crenate.

Localities. Newbern, N. C. common; Mr. Nuttall. James River, Va. very rare. Upper Tertiary.

This shell has a general resemblance to *Arca ponderosa,* of Say, but cannot be confounded with that species.

ARCA TRANSVERSA. *Tab.* 1, *fig.* 2.

Subrhomboidal, rather narrow and thin, with about 32 ribs; area very narrow, with two or three undulated grooves; series of teeth nearly rectilinear; within sulcated; margin crenate.

Syn. Arca transversa, *Say, Journ. A. N. S. v.* 2, *p.* 269.

Localities. Newbern, N. C. Mr. Nuttall. Suffolk, Va. in the Upper Marine. Near the mouth of the Potomac, in the Crag.

This species still inhabits our coast. The fossil specimens are larger and more variable in shape than the recent, except in that deposit which I term *Crag,* whenever its strata are alluded to. The species is here abundant and exactly resembles those found upon the beach. Mr. Nuttall favoured me with the specimens represented in the plate.

ARCA STILLICIDIUM. *Tab.* 1, *fig.* 3.

Subcordate, inequivalve and rather thick, with about 30 flattened ribs, crenulated on the larger valve; ribs of the opposite valve plain, except those on the anterior side, which are crenulated; beaks prominent; margin profoundly crenate.

Locality. St. Mary's River, Md. Upper Tertiary.

It resembles *A. incongrua*, Say (*A. nodosa*, Wood.)

ARCA IDONEA. *Tab* 1, *fig*. 5.

Cordate, inequivalve, ventricose, and slightly sinuous; ribs about 25, narrow and crenulated; the crenulations most distinct on the larger valve; beaks very prominent and distant; area with undulated grooves; hinge with the series of teeth contracted in the centre, and a little decurved at the ends.

Locality. St. Mary's river. Md. Upper Tertiary.

ARCA CENTENARIA. *Table* 1, *fig*. 4.

Oval or subrhomboidal, obsoletely contracted at base, with numerous radiating striæ, alternating in size; anterior and posterior margins obtusely rounded; beaks approximate, not prominent; area much contracted and transversely sulcated; series of teeth decurved at the extremities; teeth obsolete under the beaks; muscular impressions a litle raised, with a groove along the sides; margin entire.

Syn. ARCA CENTENARIA. *Say*, *Journ. A. N. S. v.* 4, *p.* 138, *t.* 10; *fig.* 2.

Locality. York Town, Va. Upper Tertiary.

ARCA INCILE. *Table* 2, *fig*. 1.

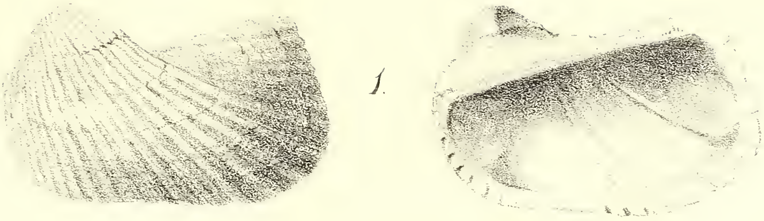
Rhomboidal; ribs about 27, finely granulated and alternated with fine lines posterior to the middle of the valve; beaks near the anterior end; not prominent; apex acute; area with transverse lines on the anterior portion, behind which is a single oblique groove extending from the apex to a little behind the middle; series of teeth rectilinear; margin crenate.

Syn. ARCA INCILE, *Say*, *Journ. A. N. S. v.* 4, *p.* 139, *t.* 10, *fig.* 3.

Locality. James River, near Smithfield, Va. Upper Tertiary.

This species varies considerably in form, and young shells are often deeply emarginate at the posterior extremity.

Pl. 2.



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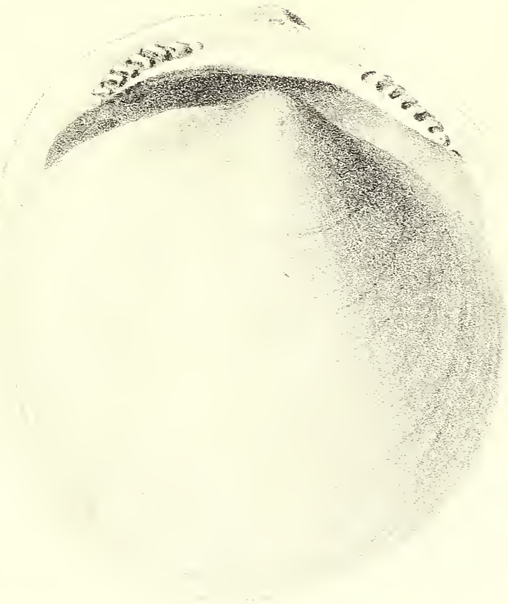

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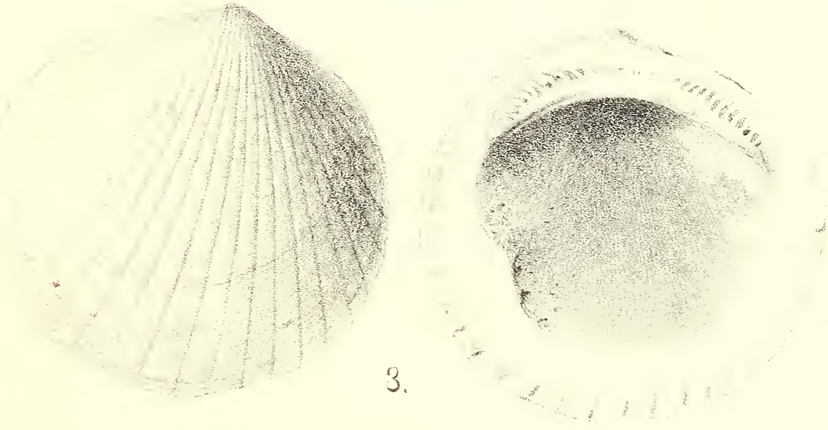

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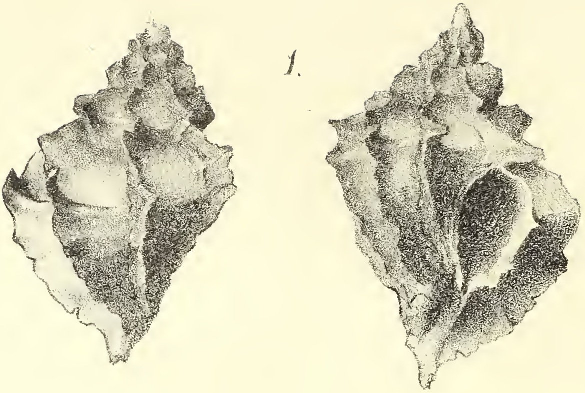

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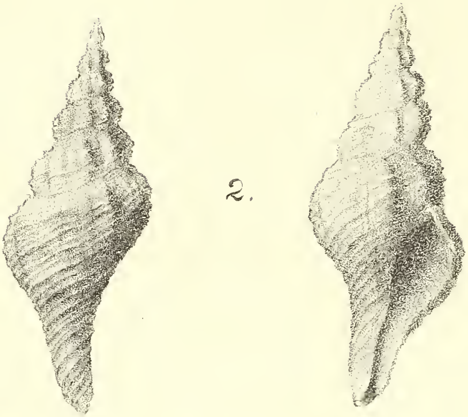

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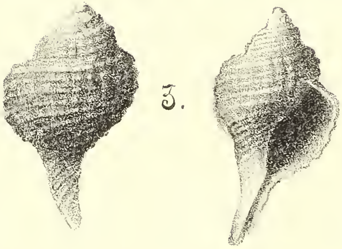

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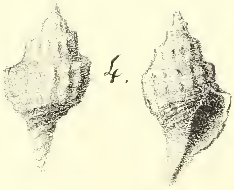

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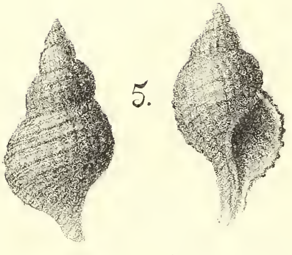

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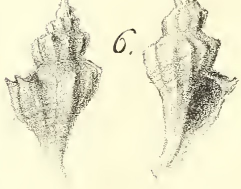

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PECTUNCULUS PULVINATUS, *Tab.* 2, *fig.* 2.

Orbicular, convex, subequilateral, with numerous radiating striæ; beaks small, central; hinge edentulous in the centre; inner margin with approximate angular lines or teeth.

Localities. York Town, Suffolk, Va. Upper Tertiary.

Syn. Pectunculus pulvinatus, *Lam. An. sans Vert. vol.* 6. *p.* 54.

This shell is very common in France and Italy. Lamarck describes three varieties, and observes that he believes it to be analogous to *P. glycimeris.*

In the vicinity of York Town, it is washed out of the high sandy banks, accompanied by the following species, from which it can always be distinguished by its orbicular form, &c.

PECTUNCULUS SUBOVATUS, *Tab.* 2, *fig.* 3.

Suborbicular or subovate; inequilateral; with radiating sulci, becoming obsolete with age; hinge, with the series of teeth cut off, and nearly obliterated in the centre, by a rectilinear line; teeth largest on the shorter side of the valve; marginal teeth broad and separated.

Syn. Pectunculus subovatus, *Say. Journ. A. N. S. v.* 4, *p.*
Pectunculus variabilis? *Sow. Min. Con. v.* 5, *t.* 471.

Localities. York Town, abundant; Suffolk, Va. Upper Ter.

If this should prove to be identical with *P. variabilis*, it will be an interesting species in consequence of its being characteristic of the same formation in Europe and America.

MUREX UMBRIFER. *Tab.* 3. *fig.* 1.

Fusiform, with 6 foliated reflected laminæ; whorls angular and carinated; aperture obovate; beak recurved.

Localities. James River; York Town, Va. Upper Tertiary.

FUSUS EXILIS. *Tab.* 3, *fig.* 2.

Fusiform, elongated, with longitudinal undulated ribs, and revolving striæ, acute, elevated and alternately smaller; beak produced, nearly straight; aperture half the length of the shell.

Locality. James River. Va. Upper Tertiary.

FUSUS SULCOSUS, *Tab.* 3, *fig.* 3.

Pyriform, ventricose, cancellated, with revolving crenulated ribs; whorls flattened above; beak produced, straight; right lip striated within.

Syn. PYRULA SULCOSA, *nob. Journ. A. N. S. v.* 6, *t.* 9, *fig.* 8.

Locality. James River, near Smithfield, Va. Upper Ter.

FUSUS STRUMOSUS. *Tab.* 3, *fig.* 4.

Fusiform; cancellated; body whorl subquadrangular, with revolving tuberculated ribs, alternated in size; whorls of the spire striated, and tuberculated at the angle; beak straight.

Locality. James River, near Smithfield, Va. Upper Ter.

FUSUS TROSSULUS. *Tab.* 3, *fig.* 5.

Fusiform; cancellated, with logitudinal ribs and revolving striæ, alternated in size; whorls rounded and regular; beak short, slightly recurved; right lip thick, striated within.

Locality. James River, near Smithfield, Va. Upper Ter.

FUSUS TETRICUS. *Tab.* 3, *fig.* 6.

Fusiform; with longitudinal acute ribs, terminating above in short spines; whorls angular and flattened above; beak long and recurved.

Locality. James River, near Smithfield, Va. Upper Ter.

FUSUS RUSTICUS. *Tab.* 4, *fig.* 1.

Fusiform; with spiral unequal impressed lines; whorls concave above, with short longitudinal undulations at the angle; margin of the right lip plicated; beak short, recurved.

Syn. FUSUS RUSTICUS, *nob. Journ. A. N. S. v.* 6, *t.* 9, *fig.* 2.

Locality. St. Mary's River, Md. Upper Tertiary.

FUSUS PARILIS. *Tab.* 4, *fig.* 2.

Fusiform, elongated, with longitudinal ribs or undulations, and rather distant revolving subacute ribs, between which are

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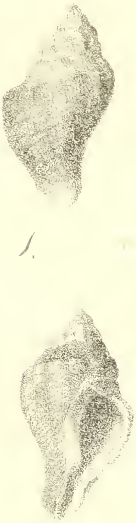
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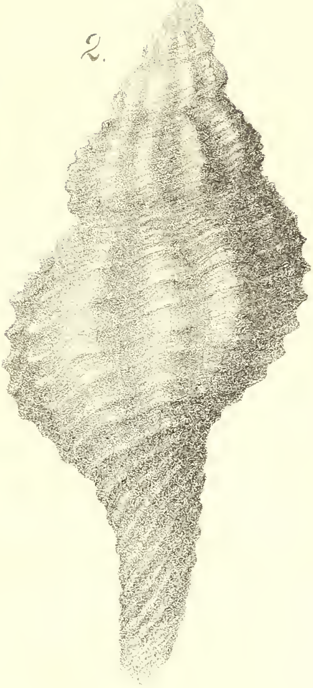
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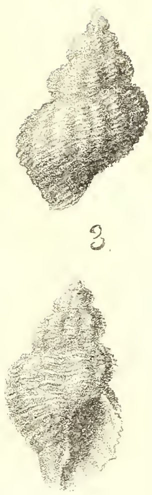
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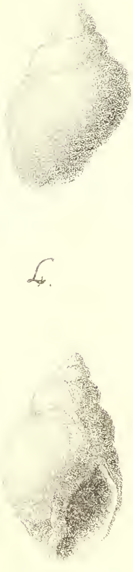
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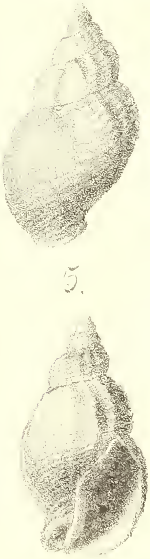
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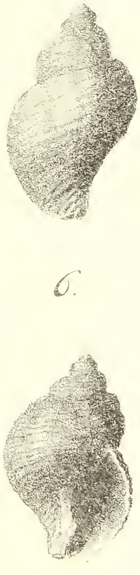
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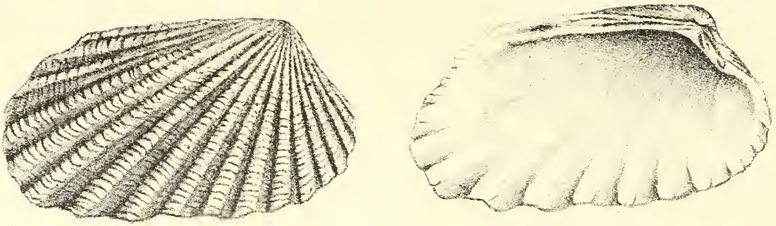

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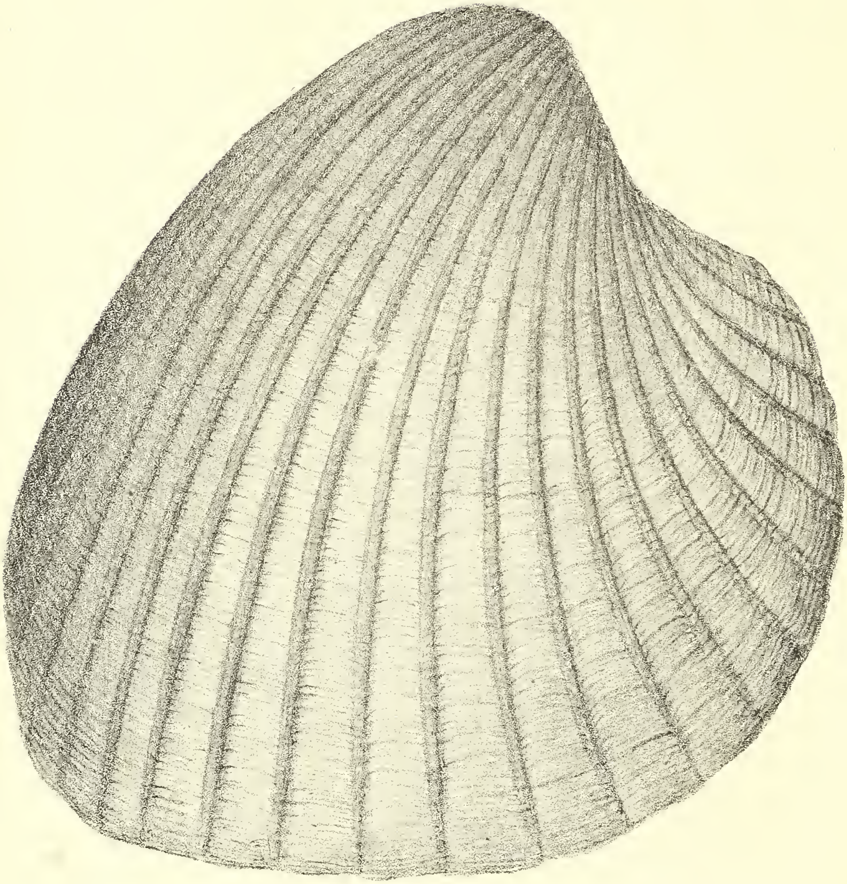

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6 or 7 fine, minutely crenulated or wrinkled striæ; beak produced and slightly reflected.

Locality. St. Mary's River, Md. Upper Tertiary.

FUSUS CINEREUS. *Tab.* 4, *fig.* 3.

Short fusiform, with large longitudinal rounded ribs and spiral elevated lines somewhat alternately smaller; beak short and slightly reflected.

Syn. Fusus cinereus, *Say. Journ. A. N. S. v.* 2, *p.* 236. *American Conch. No.* 3, *t.* 29.

Locality. James River, near Smithfield, Va. Upper Ter.

A common species on many parts of our coast, frequenting oyster beds, to which it has proved so destructive in Raritan Bay, that the owners have been obliged to remove certain beds to escape the depredations of this little univalve.

BUCCINUM PORCINUM. *Tab.* 4, *fig.* 4.

Subovate acute, thick, with numerous slight longitudinal undulations, and spiral little elevated striæ; body whorl ventricose; spire tapering and acute at the apex; aperture rather small; right lip striated within.

Syn. Buccinum porcinum, *Say, Journ. A. N. S. v.* 4, *p.* 126.

Locality. York Town, Va. Upper Tertiary.

BUCCINUM LAQUEATUM. *Tab.* 4, *fig.* 5.

Ovate conical, with spiral striæ, and minute spiral lines between; ribs or folds elevated, subacute, obsolete on the inferior half of the body whorl.

Locality. James River, near Smithfield, Va. Upper Tertiary.

BUCCINUM ALTILE. *Tab.* 4, *fig.* 6.

Subovate, with numerous longitudinal undulations and obtuse spiral striæ; body whorl rather ventricose; spire conical; apex obtuse.

Locality. James River, near Smithfield, Va. Upper Tertiary.

CYPRICARDIA ARATA. *Tab.* 5, *fig.* 1.

Oblong, with about 15 profoundly elevated scaly ribs; dorsal and basal margins parallel; anterior side very short; posterior margin oblique, angular above; inner margin crenate.

Localities. Newbern, N. C. Mr. Nuttall; James River, near Smithfield, and York Town, Va.; near Easton, Md.; Cumberland county, N. J.

CARDITA PLANICOSTA. *Tab.* 5, *fig.* 2.

Cordate; ribs about 22, broad and flattened, separated by a narrow groove which becomes obsolete at the base; ribs near the posterior end narrow, indistinct, and crossed by numerous strong wrinkles; lunule small, cordate, profoundly impressed; inner margin crenate.

Syn. Venericardia planicosta, *Lam. An. des Mus. v.* 9, *pl.* 31, *fig.* 10. *An. sans vert. v.* 5, *p.* 609. *Sowerby. Min. Conch. v.* 1, *t.* 50.

Localities. Piscataway, Md. Claiborne, Alab. Middle Ter.

This characteristic fossil is found in the equivalents of the *London Clay*, in England, France, Italy, Piedmont, and Florence. *Lam.* The figure is from an individual found in Maryland; those from Alabama are smaller and more perfect.

ARTEMIS ACETABULUM. *Tab.* 6, *fig.* 1.

Lentiform, with numerous concentric striæ, which are rather sharp and elevated on the anterior and posterior sides; cardinal fosset large, oblong, profound; with age, almost obliterating the posterior tooth; right valve with three teeth, the posterior one long and sulcated longitudinally; two anterior teeth approximate; left valve with four teeth, three of them distant; the anterior tooth somewhat pyramidal and entering a groove formed by two slight elevations in the opposite valve.

Localities. St. Mary's River, and Easton, Md.; James River, near Smithfield, and Suffolk, Va. Upper Tertiary.

This shell has been confounded with *Artemis concentrica, (Cytherea concentrica)* of our coast.

The species of this genus are still referred to *Cytherea* by

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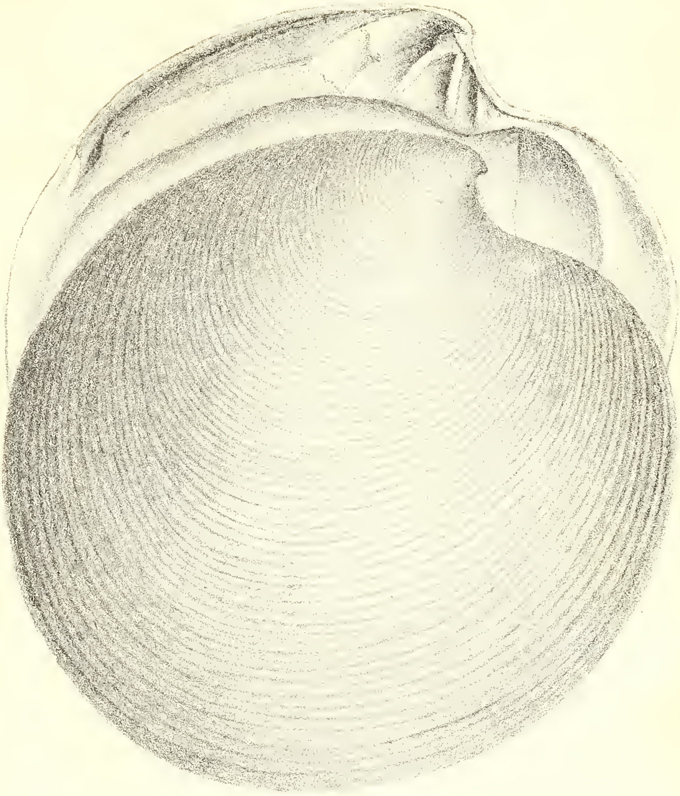

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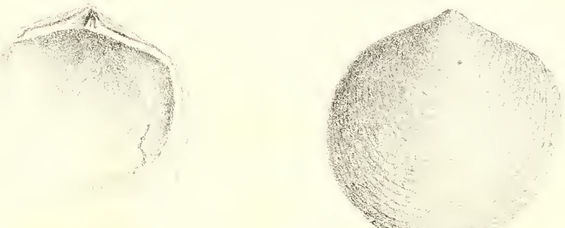

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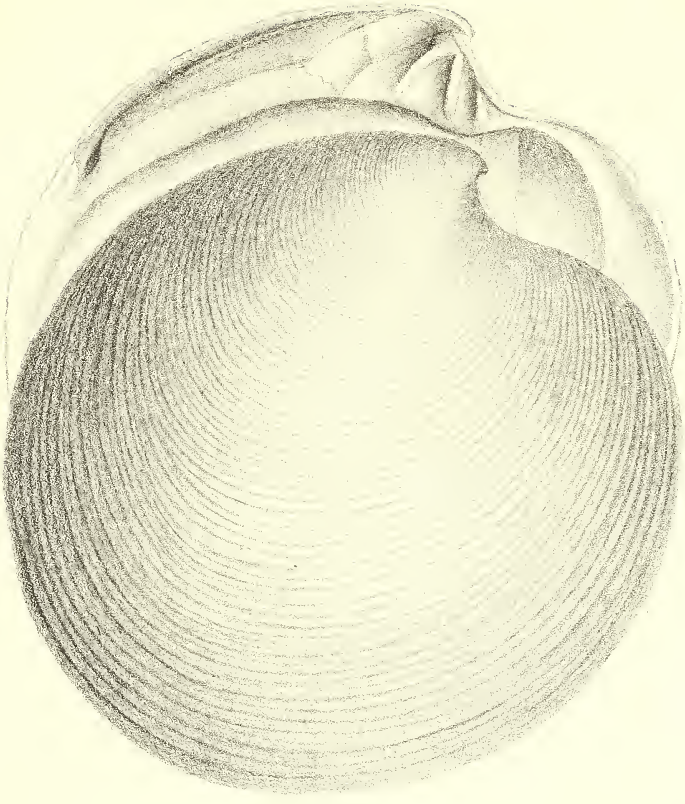

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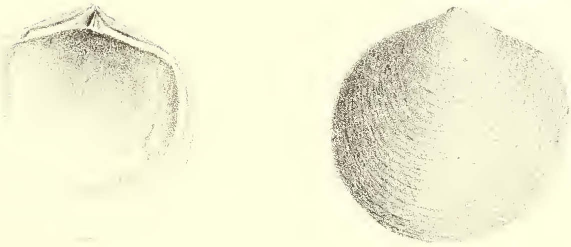

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BRITISH MUSEUM NATURAL HISTORY

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G. B. Sowerb

VOL. 1. NO. 2.

FOSSIL SHELLS

OF

THE TERTIARY FORMATIONS

OF

NORTH AMERICA,

ILLUSTRATED BY FIGURES DRAWN ON STONE,
FROM NATURE.

BY T. A. CONRAD,
Member of the Acad. Nat. Sc. of Philada.

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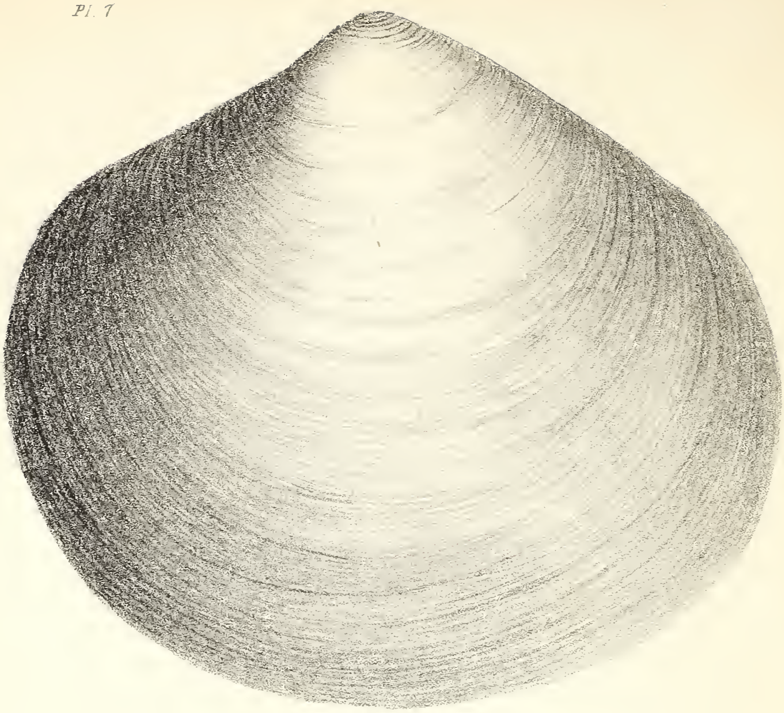

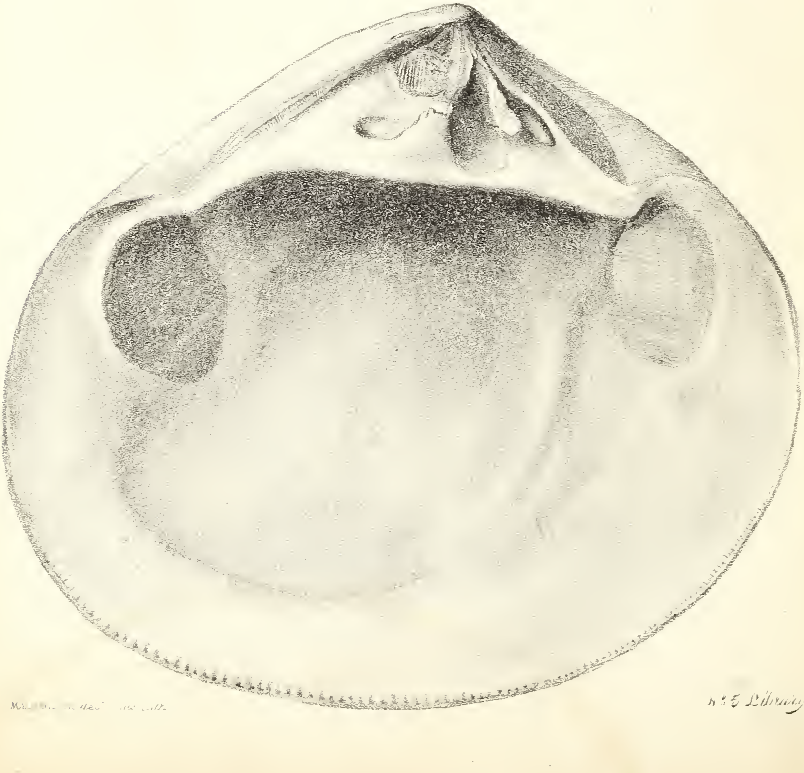

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many authors, but the hinge differs essentially, and has more the character of *Lucina*, which also has frequently the fosset under the apex. *Orbiculus*, Megerle, *Lentillaria*, Schumacher, *Exoleta*, Brown, are synonymes of the present genus which is very different from *Artemis* of Oken, an example of which is *Venus pectinata* of Chemnitz. I adopt the name given by Poli, on the authority of Blainville, as I have not seen the work in which it was originally described.

LUCINA ACCLINIS. *Tab.* 6, *fig.* 2.

Suborbicular, or lentiform, a little oblique, with strong lines of growth; hinge with 2 diverging teeth in each valve; posterior tooth of the right valve bifid; anterior muscular impression not profoundly elongated.

Locality. York-town, Va. Upper Tertiary.

This species I obtained only in a very circumscribed spot, at a considerable elevation, in sand composed chiefly of comminuted shells. This calcarious sand prevails more or less in every part of the high bank at York-town, and as it is formed of shells not partially decomposed but comminuted by attrition, the fact is obvious that it has been subjected to a violent action of the waters at a period anterior to the deposition of the perfect shells it encloses, which could only have been effected in a tranquil sea.

CRASSATELLA ALTA. *Tab.* 7.

Suboval, thick and ponderous, compressed; anterior margin obtusely rounded; posterior margin broad and slightly angular; beaks with regular concentric grooves, and somewhat angulated behind; inner margin crenulated.

Locality. Claiborne, Alab. Middle Tertiary.

This fine species is allied to *C. tumida*, Lam. but is proportionably shorter, and the beaks more central. The cartilage still remains in the valve here represented, and the shell is in the finest state of preservation.

CRASSATELLA MARYLANDICA. *Tab.* 8, *f.* 1.

Ovate oblong, thick and ponderous; posterior side narrowed and produced, with the extremity slightly angular or obtusely rounded; umbonial slope subangular; inner margin entire.

Locality. Choptank river, near Easton, Md. Upper Ter.

This species is very common and perfect, the valves being generally in their natural connexion. It is distinguished from other American Crassatellæ by its smooth and entire surface.

The bank of the Choptank river, where this species is found, is twenty-five or thirty feet high and perpendicular from the water when the tide is in. A stratum at the base, about twelve feet thick, is composed almost entirely of bivalve shells, the most abundant of which are a large species of *Cytherea* and the shell above described, neither of which have I yet seen in any other deposit.

It is remarkable that although our Upper Marine contains several species of *Crassatella*, all of which are abundant, yet this appears to be the only genus of that formation, with the exception of a *Pholadomya*, without a living representative on the coast of North America.

Blainville observes, that this genus is remarkable from the circumstance, that all the recent species which it contains, eleven in number, exist only in the seas of Australasia, although there are seven in the fossil state in France. De France, with some doubt, enumerates twenty in the inferior Chalk.

CRASSATELLA PROTEXTA. *Tab.* 8, *fig.* 2.

Elongated; umbonial slope angular or obscurely plicated; the posterior side produced, or rostrated with age, and the extremity obliquely truncated; beaks with concentric grooves; inner margin crenulated.

Locality. Claiborne, Alab. Middle Tertiary.

This fine shell, though variable in outline, is distinguished by a length, in proportion to the height, unusual in the genus, it is abundant, and a single valve measures 2½ inches in length and 1 inch and 3 tenths in height.

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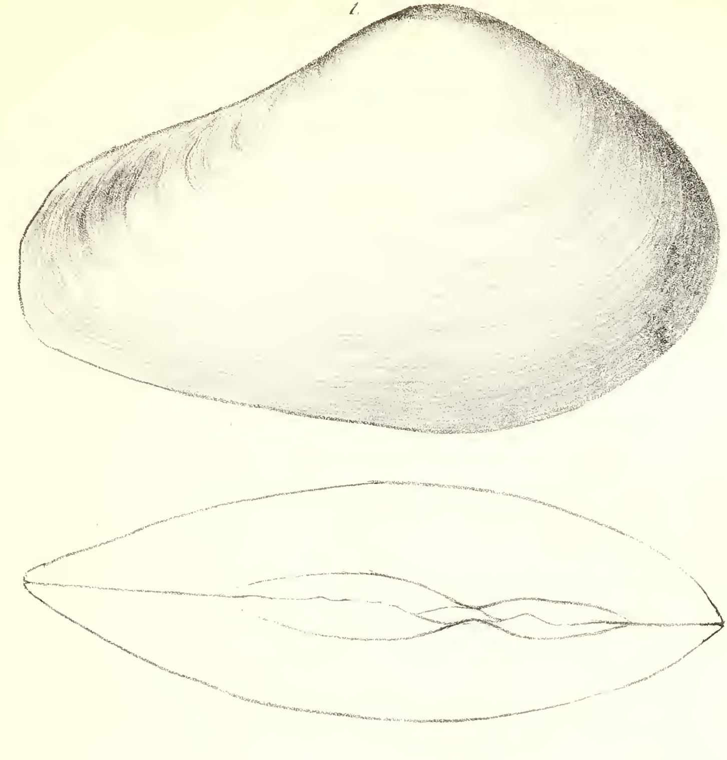

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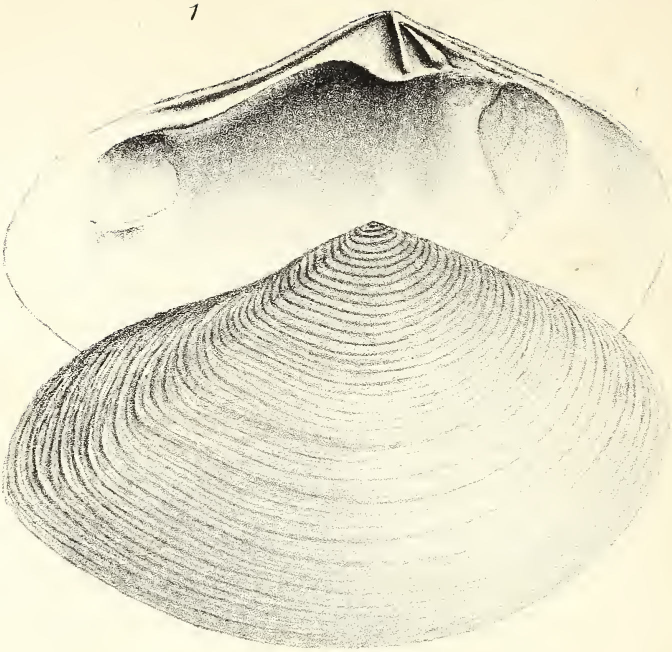

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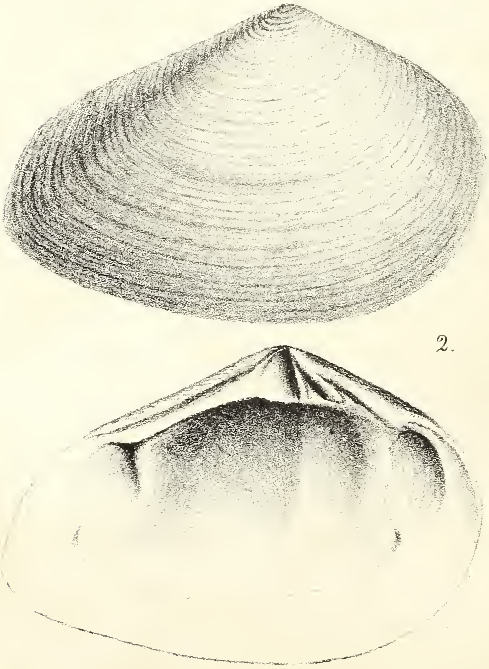

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CRASSATELLA UNDULATA. *Tab.* 9, *fig.* 1.

Oblong subovate, much compressed, with coarse concentric lines; umbo flattened, and with regular concentric grooves; apex subacute; inner margin entire.

Syn. Crassatella undulata, *Say. Journ. A. N. S. v.* 4, *pl. xi, fig.* 2.

Localities. James River, near Smithfield, Va.; abundant; York-town, Va. Upper Tertiary.

Variety, A. Thick and ponderous; not much compressed. A specimen in the collection of the Academy is marked St. Mary's county, Md.

Young shells of this species closely resemble *C. compressa* of Lamarck, as figured in Deshayes' *Coq. Fos. des env. de Par.*

CRASSATELLA MELINA. *Tab.* 9, *fig.* 2.

Ovate, thick, not compressed; anterior margin obtusely rounded; posterior margin oblique and angular; dorsal margin nearly straight; concentric lines coarse; umbonial slope subangular and scarcely curved; beaks with concentric grooves; inner margin entire.

Locality. Cumberland Co. N. J. Upper Tertiary.

This shell is intermediate to *C. undulata* and *Marylandica*, but is perfectly distinct from both. It occurs abundantly in the tertiary marl, accompanied by *Perna maxillata* and several new and interesting species. The existence of this formation in New Jersey was first ascertained by means of some fossils brought very lately from Stow creek, by Mr. Samuel Griscom, who has since accompanied me to the spot. We traced it several miles north of Stow creek, and in one instance found its surface composed of a bed of the *Ostrea virginiana* or common oyster, erroneously supposed to have been deposited by the Indians. These beds occur in the same manner at Easton, Md. and except in the *Crag* on the Potomac, always present fragments of *Pecten madisonius*, and other extinct species. There can be little doubt that all those beds of oyster shells beneath the superficial soil, and elevated above the level of the sea, on the coasts of New Jersey and Long Island, are referrible to the Upper Marine formation.

TURBINELLA PYRULOIDES. *Tab.* 10, *fig.* 1.

Pyriform, ventricose, smooth; with obscure spiral striæ on the inferior half of the body whorl; spire very short; apex slightly mammillated; columella with 4 distant oblique plaits.

Locality. Claiborne, Alab.; very abundant. Middle Ter.

Mr. Vanuxum obtained this species in Georgia, replaced by silex and translucent; it accompanied a species of *Cytherea* which also occurs at Claiborne, and probably the fossils of these silicious beds, when further examined, will enable us to refer them to the middle tertiary. This formation extends west of the Mississippi, as I have lately ascertained by means of specimens of ferruginous marl, sent, by Judge Bry of Louisiana, from a locality on the Ouachitta river. They were presented to the American Philosophical Society, and are almost entirely composed of a species of *Corbula*, very common and characteristic in the sandy deposits at Claiborne, and hardly to be distinguished from *C. angustata* of Sowerby, figured in the Transactions of the Geological Society.

ANCILLARIA ALTILE. *Tab.* 10, *fig.* 2.

Obovate acute; body whorl ventricose; spire rather abruptly contracted, subulate towards the apex which is acute; suture obsolete; columella callous, much thickened and projecting above.

Locality. Claiborne, Alab. Middle Tertiary.

The genus *Ancillaria* appears to be very characteristic of the equivalents of the *London Clay*, most of the known species appertaining to that formation. In the superior beds I have not detected a single species, nor does any exist upon our coast.

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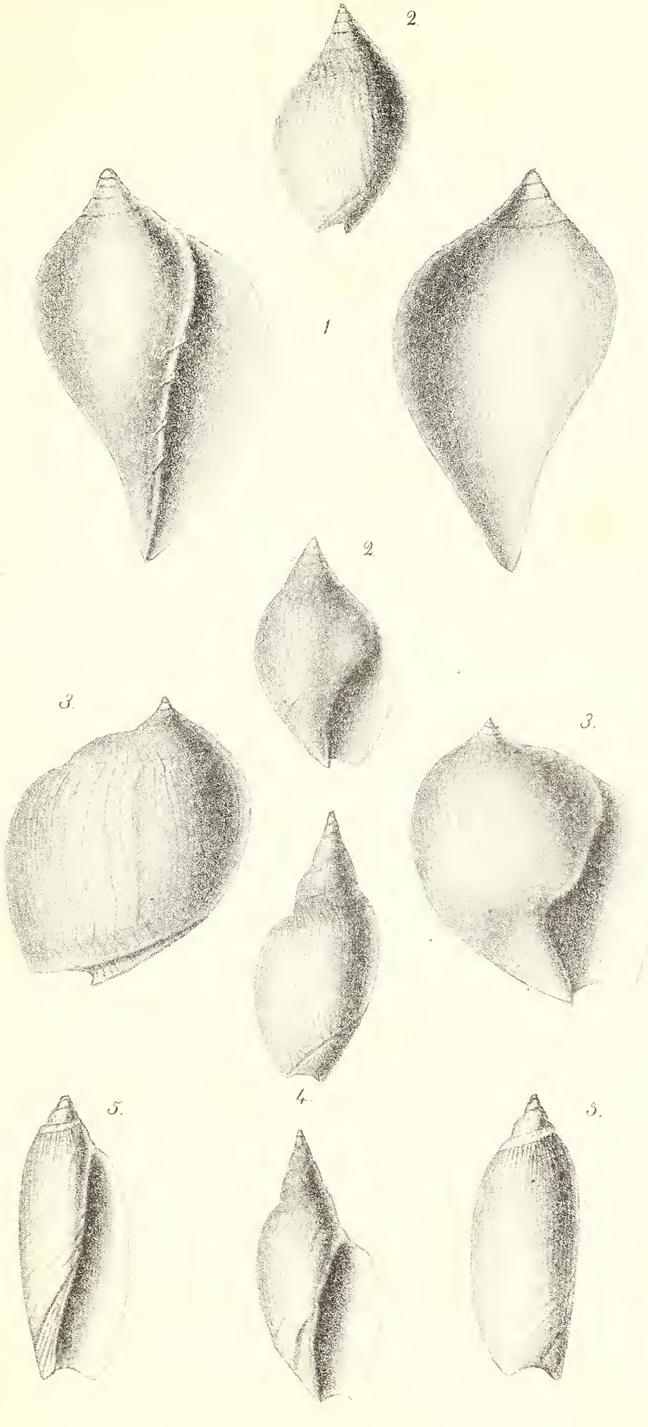

T.A.C. del.

Keineay & Lucas's Lith.

ANCILLARIA SUBGLOBOSA. *Table* 10, *fig*. 3.

Subglobose or suboval; spire convex, with the tip suddenly exserted and subulate; apex acute; suture obsolete; columella profoundly callous, and projecting in the middle.

Locality. Claiborne, Alab. Middle Tertiary.

This singular species is perhaps the most ventricose of the genus, but has all the characters of *Ancillaria*. As several individuals were sent among other shells collected at random, they are probably abundant.

ANCILLARIA SCAMBA. *Tab*. 10, *fig*. 4.

Subulate, turreted; spire elevated; suture obsolete; columella concave and callous; aperture about half the length of the shell and effuse at the base; right lip emarginate at the superior termination; callus at the base elevated and defined by two angular lines.

Locality. Claiborne, Alab. Middle Tertiary.

ANCILLARIA STAMINEA. *Tab*. 10, *fig*. 5.

Cylindrical, with strong longitudinal lines and minute revolving wrinkled striæ; a slight elevation crowns the whorls, defined by a separating line; spire very short, apex rather obtuse; suture distinct; inferior portion of the columella with an elevated profoundly striated callus, above which are three or four lines revolving to the base; aperture gradually contracted above and effuse at the base.

Locality. Claiborne, Alab. Middle Tertiary.

Of the species described by Lamarck, this shell approaches nearest to *A. canalifera*. These two species do not correspond entirely with the genus *Ancillaria*, as the aperture is much longer, the shells are striated, and the suture is somewhat channeled. They might constitute a separate genus by the name of OLIVULA, and would connect *Ancillaria* with *Oliva*.

MACTRA DELUMBIS. *Tab.* 11.

Suboval, thin and fragile, with a fold on the posterior submargin; umbo prominent; beaks nearly central, approximate; lunule much elongated, lanceolate, slightly impressed.

Localities. James River, near Smithfield; Suffolk, Va. Upper Tertiary.

This fine species is not uncommon in the blue marl of certain districts, but is so extremely fragile that entire valves can rarely be obtained. In the banks of St. Mary's river, Maryland, a *Mactra* has been discovered, which, so far as a very imperfect valve admits of determining, appears to be identical with the present species.

PHOLADOMYA ABRUPTA. *Tab.* 12.

Oblong oval, much compressed, with from three to five subacute distant ribs or ridges diverging from the apex; one side rather thick and strong, rounded at the extremity; the opposite side extremely thin, and reflected, with a truncated margin; muscular and palleal impressions distinct.

Locality. York-town, Va. Upper Tertiary.

This rare shell has been found only in the locality above mentioned, where I procured two imperfect valves, and Mr. Finch informs me that he also obtained a broken specimen.

The genus *Pholadomya* embraces but few species, and they chiefly belong to Secondary formations. M. Marcel de Serres, however, has detected this genus in the tertiary marls of the South of France, and one recent species is known, which is figured in Sowerby's Genera of Shells.

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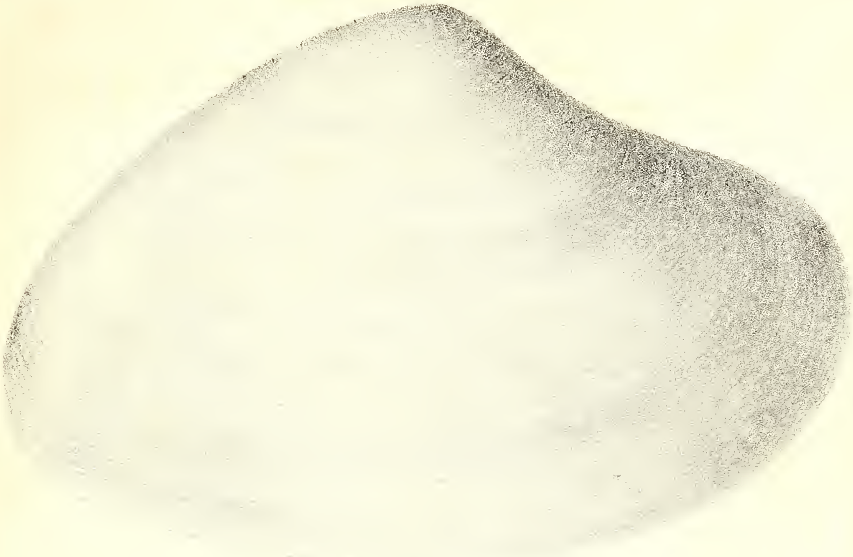

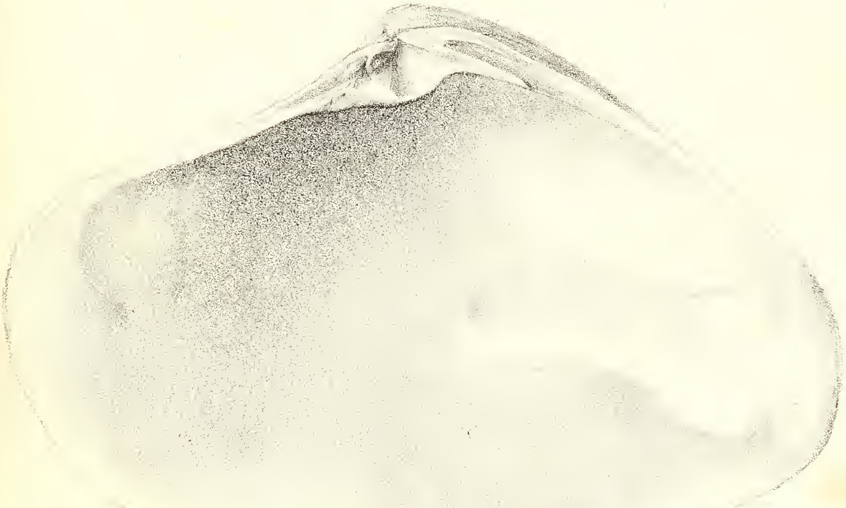

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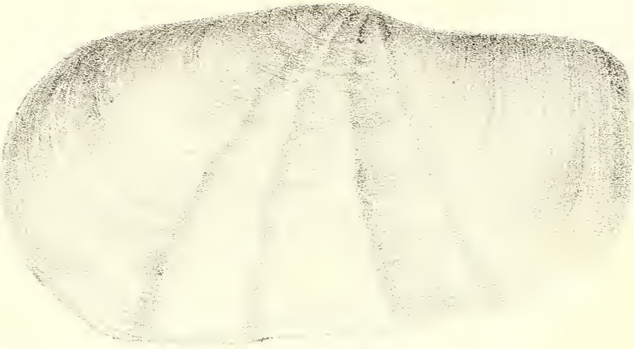

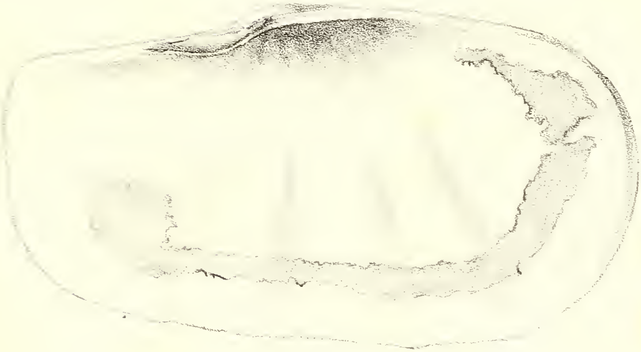

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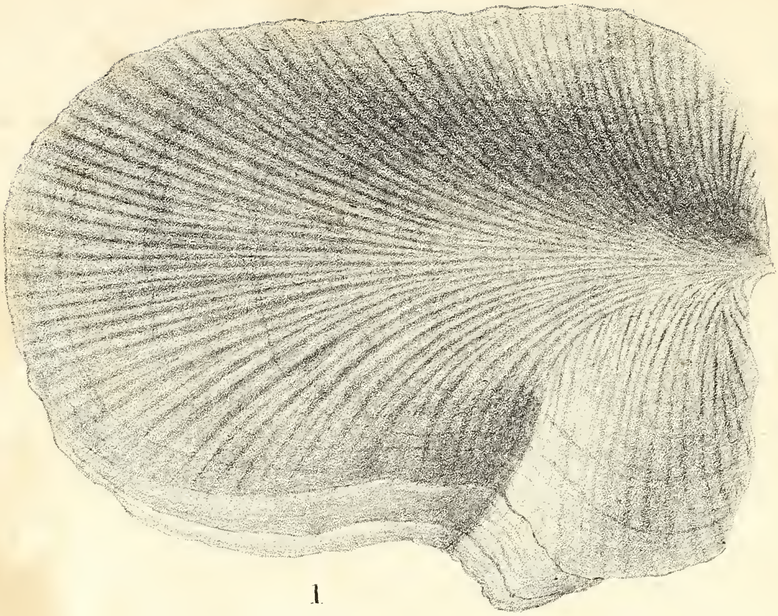

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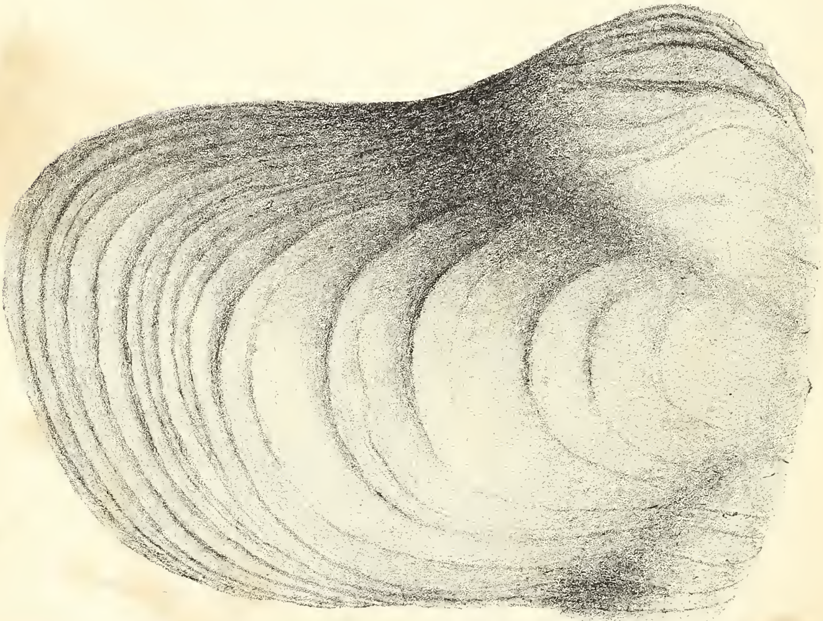

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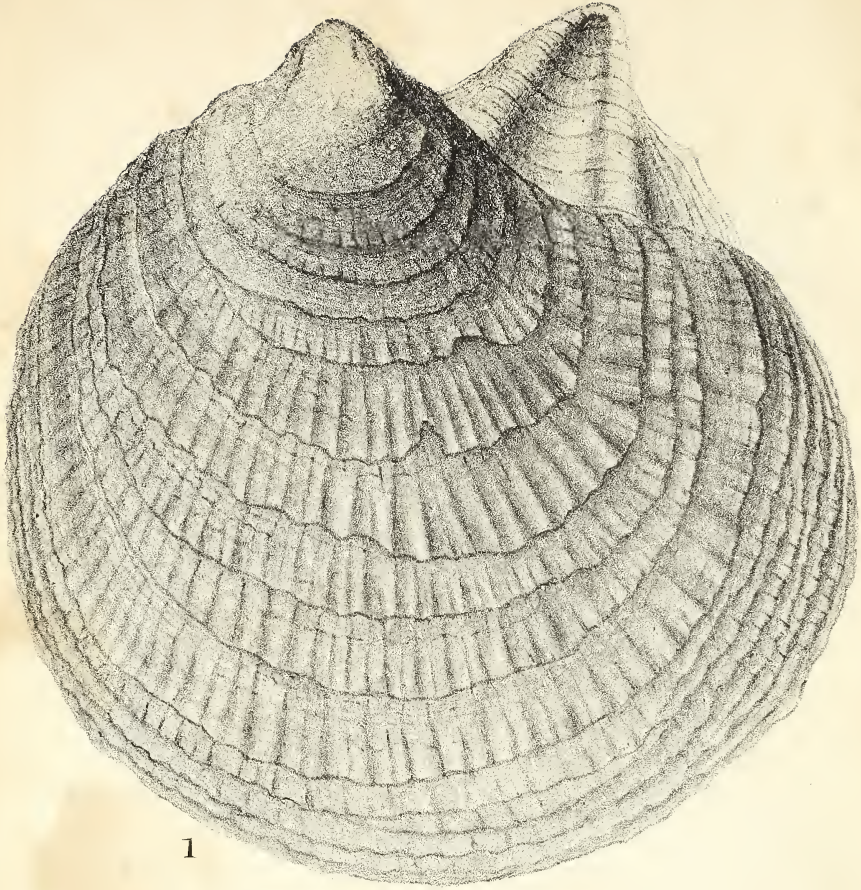
T.A.C. del.

Kennedy & Lucas's. Lithography.

14



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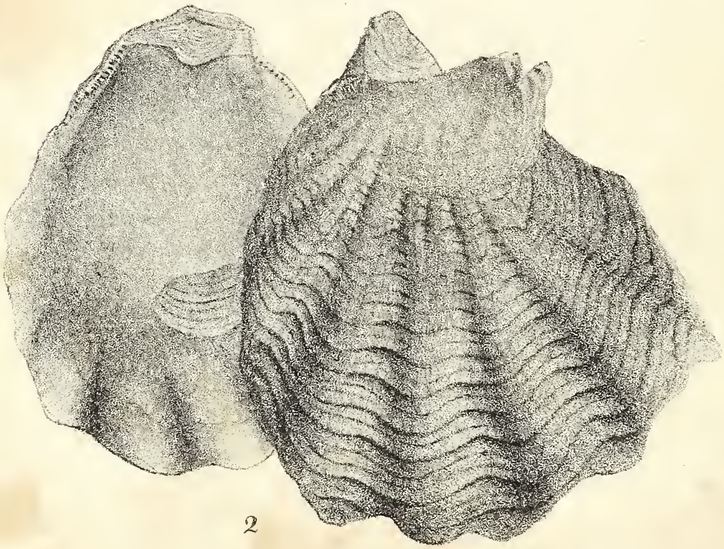

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Kennedy & Lucas's. Lithography

OSTREA RADIANS. *Tab.* 13, *fig.* 1.

Oblong, compressed, lobed and flexuous on one side; the ribs numerous, radiated; beaks very small, not prominent, pointed and a little curved laterally.

Localities. Vance's Ferry, S. C.; Claiborne, Alab. Middle Tertiary.

This elegant species, remarkable for the regularity of the ribs, was found in the former of these localities by my friend Dr. Blanding, and others have come under my observation, from Claiborne, where they form an entire bed or stratum, but are almost all in fragments, firmly united by a calcarious cement.

OSTREA SELLÆFORMIS. *Tab.* 13, *fig.* 2.

Oblong, convex, thick and ponderous, lobed; one side of the larger valve profoundly sinuous and the opposite side gibbous; smaller valve sinuous and little convex; dorsal margin long and slightly arched, with both extremities obtusely rounded.

Localities. Claiborne, Alab. Middle Tertiary.

This singular shell does not vary greatly in its outline, and is very unlike any other species of this country with which we are acquainted. It is often extremely thick and ponderous.

OSTREA CAROLINENSIS. *Tab.* 14, *fig.* 1.

Obovate, oblique, thick, compressed; superior valve flat; inferior valve convex, with concentric imbricated laminæ which are transversely plicated; beaks broad and prominent; fosset large and defined by broad prominent lateral ridges.

Locality. Santee Canal, S. C.

A large and handsomely plicated oyster, having considerable resemblance to *O. compressirostra* of Say, but the beaks in that species are very small and compressed, whilst in the former they are broad and prominent, and the shell attains a greater size and thickness with an approach to a falcate form.

Numbers were thrown up in excavating the Santee canal, and from its abundance in South Carolina, I have given the specific name of *Carolinensis*. As I have not seen it *in situ*, and am ignorant of its accompanying fossils, I cannot positively refer it to the Middle Tertiary, to which it probably belongs.

OSTREA VIRGINIANA, VAR. *Tab.* 14. *fig.* 2.

Obovate, profoundly plicated, and with concentric imbricated laminæ; superior valve flat, plicated, beaks laterally curved.

Syn. Ostrea Virginiana, *Gmel.*
Ostrea Virginica, *Lam. An. sans vert, v.* 6, *p.* 207.

Locality. Suffolk, Va. Upper Tertiary.

A common variety of this species, both in a recent and fossil state, and fine specimens of the former may be obtained on the coast of New Jersey.

As a fossil, the *O. Virginiana* is no less variable than when recent, and occurs in a stratum with but little intermixture of other shells, which, wherever found, constitutes the superior bed of the formation it belongs to, although detached shells may be taken from any portion of the various deposits. Even in the *Crag* it exhibits the same relative position, and seems to have been the last bed deposited by the waters of the retiring ocean. The town of Easton, on the Eastern Shore of Maryland, stands upon a bank of these oyster shells, which in many places in the vicinity of the town, may be seen, very entire, and mingled with the superficial soil; beneath them are the Tertiary marls, containing the usual characteristic species, but so far decomposed as to be scarcely recognizable. This species is also found in various parts of Europe, and is considered by Brongniart as a characteristic fossil.

A very large oyster, probably identical with the present, extends in a continuous bed through South Carolina, Georgia, Alabama, and Mississippi. Mr. Finch considers this a distinct formation, and terms it *Calcaire Ostree;* but before we adopt it as such, it is necessary that it should be carefully examined, and therefore a detailed account of it will be reserved for a future number of this work.

Mr E. J. Templeman 20/11/47. 2 pts. 7/1. A/33

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cover only

From the liberal patronage extended to similar publications in Europe, and the interest which Geology has excited in this country, the author of the present humble work was induced to hope that he would at least dispose of a sufficient number of copies to defray the expenses of the first number; but he has been disappointed. The second number is now, however, offered to the friends of science, with *eight* lithographic plates illustrating *seventeen* species, *fifteen* of which have never before been figured; and the author begs leave to state, that if sufficient encouragement is extended, he will include in twelve numbers at least *one hundred plates* and *three hundred species*, a much greater number of American tertiary fossils than at present exist in our collections, but which the author expects to obtain whilst on a visit to the Southern States in the course of the present winter; a journey which he confidently believes will furnish novel and interesting facts in the Geological relations of extensive beds of organic remains, adding greatly to the value of his present publication.

The *Third number* will appear when the sale of the first shall warrant its publication, and the work will be completed, so far as the materials can be procured, within two years from the date of the 3d No.

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